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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/811,932	03/30/2004	Hongyu Yue	240474US-6YA	2911

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EXAMINER	
DESTA, ELIAS	
ART UNIT	**PAPER NUMBER**
2857	

DATE MAILED: 12/19/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

A2

Office Action Summary	Application No.	Applicant(s)	
	10/811,932	YUE ET AL.	
	Examiner	Art Unit	
	Elias Desta	2857	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *14 September 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-55* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-34 and 39-55* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☒ Claim(s) *35-38* are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *30 March 2004* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *11/15/2005*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Detailed Action

Restriction/Election

1. Applicant's election with traverse, *claims 1-34 and 39-55* of *Group I* in the reply filed on *September 8, 2005* is acknowledged. The traversal is on the ground(s) that the search required to examine the entire application would not place a serious burden on the examiner. This is not found persuasive because *claims 1-34 and 39-55* of Group I and *claims 35-38* of Group II are distinct inventions. The Examiner has shown that the apparatus as claimed (Group II) can be used to practice another and materially different process, such as GUI used in automobile manufacturing plant in controlling robot arms or in food processing plants.

The requirement is still deemed proper and is therefore made FINAL.

Drawing

2. The drawing is objected to because of the following minor informalities:

- Figs. 1-6: boxes should be labeled as to function (similar to Fig. 11 of the instant application).

Claim rejection – 35 U.S.C. § 101

3. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

4. The claimed invention is directed to non-statutory subject matter. *Claims 1-55* appear to be nonstatutory and are rejected under 35 U.S.C. § 101 because the claimed subject matter is only measuring and calculating, so it represents an algorithm with a measuring step.

In this instance, transformation of data, representing discrete values, by a machine through a series of mathematical calculations into a final output, does not constitute a practical application of a mathematical algorithm, formula, or calculation, because it does not produce a useful, concrete and tangible result, see State Street, 149 F.3d at 1373, 47 USPQ2d at 1601. The claims are directed essentially to a method of calculating a new process control input data where the algorithm lacks the final step of an output, which is useful, concrete and tangible result to make it statutory even though the solution is for a specific purpose.

Claim rejection – 35 U.S.C. § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) The invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

6. *Claims 1-34 and 39-55* are rejected under 35 U.S.C. 102(e) as anticipated by *Pasadyn et al.* (U.S. PAP 2005/0221514, hereon *Pasadyn*).

In reference to claims 1, 18, 32 and 39: *Pasadyn* teaches a method of controlling a process in a semiconductor manufacturing system (see *Pasadyn*, page 2, paragraph 14, lines 1-9). The method includes:

- Setting process control input data for the process in the semiconductor manufacturing system (see *Pasadyn*, page 3, paragraph 43, lines 6-15);
- Measuring process control output data from the process in the semiconductor manufacturing system (see *Pasadyn*, page 4, paragraph 45, lines 6-8);
- Determining a relationship between the process control output data and the process control input data because the system uses a closed-loop, run-to-run model where an input-output relationship is established (see *Pasadyn*, page 4, paragraph 44, lines 11-13); and
- Calculating new process control input data by minimizing the difference between the target process control output data and predicted process control output data is determined using the relationship applied to the new process control input data (see *Pasadyn*, page 4, paragraphs 49-51).

With regard to claims 2, 19, 33 and 40: *Pasadyn* further teaches that updating the relationship between the process control input data and process control output data (see *Pasadyn*, page 5, paragraphs 53-54)

With regard to claims 3, 20 and 41: Pasadyn further teaches that updating the relationship includes using an exponentially weighted moving average (EMWA) filter (see Pasadyn, page 9, paragraph 91 and equation 1).

With regard to claims 4, 5, 42 and 43: Pasadyn further teaches that calculating the new process input data includes weighing the process control input data prior to calculating new process control input data (see Pasadyn, page 9, paragraph 95); and weighing the process control output data prior to calculating new process control input data (see Pasadyn, page 9, paragraph 97).

With regard to claims 6 and 44: Pasadyn further teaches that the calculating method includes minimizing the difference between the process control input data and the new process control input data (or error function) (see Pasadyn, page 4, paragraph 49)

With regard to claims 7, 21 and 45: Pasadyn further teaches that determining the process control input and output data includes developing a relationship with a process model developed using partial least square (PLS) analysis (see Pasadyn, page 4, paragraph 48, lines 23-25)

With regard to claims 8, 9, 22, 23, 46 and 47: Pasadyn further teaches that determining the relationship between the process control output and input data includes developing the relationship with multiple input-multiple output process model (MIMO) because the single model would be modified to accommodate multiple processing contexts (see Pasadyn, page 31, paragraph 333); and developing

as a MIMO process model characterized by an equation with control output data and input data with array of constants with a function as a factor of the input variables (see *Pasadyn*, page 5, paragraph 54, equation 'Co' representing input/output relationship).

With regard to claims 10, 11, 24, 25, 48 and 49: *Pasadyn* further teaches that function that describes control output as a function of the input and some other constant represents a non-linear and linear function [see *Pasadyn*, pages 4-5, paragraph 52 (the premises is that a non-linear function could be approximated or forced to behave like a linear function without loss of generality in obtaining the desired outcome)]

With regard to claims 12, 13, 14, 26- 28, 34, 50, 51 and 52: *Pasadyn* further teaches that setting the process input data includes an etch process and RF power (see *Pasadyn*, page 6, paragraph 66).

With regard to claims 15, 29 and 53: *Pasadyn* further teaches that measuring process control output data includes a deposition rate or time (see *Pasadyn*, page 6, paragraph 66).

With regard to claims 16, 30 and 54: *Pasadyn* further teaches that measuring process control output includes modeling a state space representation which inherently includes measuring critical dimensions at the top, bottom, slope and sidewall of the contact of the wafer because it is well known in the art that during wafer manufacturing, the control variables includes dimensional or state-space

variables that would be measured to make sure manufacturing variables are controlled to obtain desirable output (see *Pasadyn*, page 10, paragraphs 110-111, and pages 27-28, paragraphs 289-291).

With regard to claims 17, 31 and 55: Pasadyn further teaches that minimizing the difference (error function) using an equation (see *Pasadyn*, page 4, paragraph 50). The instant claims call for the Newton-Rhapson equation where the equation is used to obtain zeros of multidimensional functions (for instance, see *Parmore*, 'Simple Curve Fitting', page 1, abstract). The equation is used to relate multiple spectral data fit to a Gaussian function. Since *Pasadyn* uses Gaussian model to minimize the noise or error values (see *Pasadyn*, page 4, paragraphs 51-52) where the best error fit values are represented as linear function, it is inherent to say that *Pasadyn* would use Newton-Rhapson or equivalent equation to obtain zeros of the multidimensional functions.

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant disclosure.

- *Choi et al.* (U.S. Patent 5,940,299) teaches system and method for controlling a process-performing apparatus in a semiconductor device manufacturing process.
- *Boiquaye* (U.S. Patent 6,249,712) teaches adaptive control process and system.

- *Stoddard et al.* (U.S. Patent 6,589,744) teaches run-to-run controller for use in microelectronic fabrication.
- *Hsiung et al.* (U.S. Patent 6,853,920) teaches control for an industrial process using one or more multidimensional variable.
- *Funk* (U.S. PAP 2004/0267399) teaches feed-forward and feedback wafer-to-wafer control methods for etch process.
- *Mitrovic* (U.S. PAP 2005/0071039) teaches a system and method for using first-principles simulation to provide virtual sensors that facilitate a semiconductor manufacturing process.
- *Patel et al.* (IEEE Article, 'Adaptive Optimization of Run-to-Run Controllers: The EWMA Example') teaches a recursive scheme for optimizing the gain of an exponentially weighted moving average (EWMA) controller under stability constraints.
- *Del Castillo et al.* (IEEE Article, 'An Adaptive Run-to-Run Optimizing Controller for Linear and Nonlinear Semiconductor Processes') teaches a run-to-run (R2R) multiple-input-multiple-output controller for semiconductor manufacturing processes')
- *Mozumder et al.* (IEEE Article, 'A Monitor Wafer Based Controller for Semiconductor Processes') teaches a multivariable adaptation methodology for feedback controller that employs a layered process/equipment model.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Elias Desta whose telephone number is (571)-272-2214. The examiner can normally be reached on M-Thu (8:30-7:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Marc S. Hoff can be reached on (571)-272-2216. The fax phone numbers for the organization where this application or proceeding is assigned are (571)-273-8300 for regular communications and After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (571)-272-1750.

Elias Desta
Examiner
Art Unit 2857

-ed

November 23, 2005

Marc Hoff
MARC S. HOFF
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800